ZENA™ mobile welding system

Power Generator Testing/Cleaning

for All ZENA™ Mobile Welders Utilizing Factory Installed ZENA™ Series 150, 200, or 250 Power Generators
This document contains the latest information available at the time of preparation. Every effort has been made to ensure accuracy. However, ZENA, Incorporated takes no responsibility for errors or consequential damages caused by reliance on the information contained herein.

ZENA, Incorporated reserves the right to make product enhancements and/or modifications at any time without prior notice.

**Copyright 2005, 2007, 2008 by ZENA, Incorporated.**

All rights reserved. No part of this publication may be reproduced in any form or by any means without the prior written permission of the publisher.

**ZENA, Incorporated**  
**330 Club Springs Road**  
**Elmwood, Tennessee 38560**

Printed in U.S.A.

ZENA™ is a trademark owned by ZENA, Inc. for its welding systems and related products.  
ZENA™ is a trademark owned by ZENA, Inc. for its farm tools and equipment.  
Protected by US Pat. 6,512,119. Other US & Foreign Patents Pending
Table of Contents

ZENA™ Power Generator Testing (all models) ......................................................................................................................... 1
  Belt Drive ........................................................................................................................................................................... 1
  Electrical Function ............................................................................................................................................................. 1

ZENA™ Power Generator Care & Maintenance ................................................................................................................... 3
  A. Lubrication ................................................................................................................................................................... 3
  B. Wet Conditions ............................................................................................................................................................ 3
  C. Cleaning ..................................................................................................................................................................... 3
  D. DO NOT... ................................................................................................................................................................. 4

Cleaning Slip Rings/Brushes .................................................................................................................................................. 5
  Step 1 – Inspection Cleaning PRIOR to Removal from Drive Motor .................................................................................. 5
  Step 2 -- Disassembly ...................................................................................................................................................... 5
  Step Three – Slip Ring Cleaning ..................................................................................................................................... 6
  Step Four – Reassembly .................................................................................................................................................. 7

Return for Service ............................................................................................................................................................... 8
ZENA™ Power Generator Testing (all models)

Belt Drive

Proper belt drive efficiency is key to insuring long term trouble free generator operation. This is achieved by having three things in balance -- drive pulley size, drive pulley belt wrap, and proper belt tension. Not too loose and definitely not too tight. If things are in balance, belt tension will be correct and the belt will not slip.

A quick method of checking belt tension and slip is to span the generator pulley with the thumb and forefinger of both hands. Then try to turn the generator in the direction of its normal rotation for V-belt drive, and in the opposite direction for serpentine/flat belt drive installations, using as much rotational force as you can exert by hand while carefully observing belt tension on each side of the generator pulley. Unless you are VERY strong, you should not be able to get the belt to slip. And, just as important, you should see/feel a slight amount of slack in the belt on one side of the pulley.

Static test belt tension can also be tested (a bit more accurately) by using a properly sized socket wrench on the power generator’s pulley bolt to try to rotate the power generator in the direction of its normal rotation for V-belt drive installations, and in the opposite direction for serpentine/flat belt drive installations. The pulley should be quite difficult to turn using moderate hand pressure. Often an engine will "turn over" before any belt slip will be noted. At the same time, you should notice a very slight slackening of the belt tension on one side of the pulley. If any slippage is noted, the point of failure should be easy to determine.

Belt tightness should be rechecked after the first few of hours of operation.

Electrical Function

You can easily check for a component failure in the Power Generator by following the following procedure.

Disconnect the two wires which are used to connect the Control Module or Voltage Regulator to the Power Generator’s control (1/4” spade) terminals, and check in the electrical resistance between either of the terminals and the case of the Power Generator.

A normal reading is an “open” circuit (an infinite resistance).

If your meter shows any measurable resistance, in either test, your Power Generator has either a brush assembly, or rotor assembly failure, and should be returned for repair1.

If your meter shows no measurable resistance, check the electrical resistance between the two Power Generator control (1/4” spade) terminals with an ohm meter. A normal reading is between 1.8 and 2.4 ohms2. If your meter shows a resistance of less than 1.8 ohms, your Power Generator may have a rotor failure (or the remote possibly that there is a piece of foreign matter bridging the brushes), and should be returned for repair3.

If the electrical resistance measured between the control terminals is higher than the “normal” range of 1.4 to 2.4 ohms4 (for example, 10 ohms, or 20 ohms, or more) it is

---

1 If desired, this component is field replaceable by a competent technician (or skilled owner).

2 A reading of as much as 3-5 ohms may be “normal” – a result of a brush being slightly out of position when the generator is not rotating. Spin the generator and retest if this sort of reading occurs.

3 If desired, this component is field replaceable by a competent technician (or skilled owner).

4 A reading of as much as 3-5 ohms may be “normal” – a result of a brush being slightly out of position when the generator is not rotating. Spin the generator and retest if this sort of reading occurs.
typically an indication that grease, or some similar material may have caused “fouling” or glazing of the brushes and/or internal slip-rings. Cleaning can be accomplished in the field, if necessary, but is best done under factory (dust free) conditions.

Disconnect the generator’s output terminal from any load, and check in the electrical resistance between each of the terminals and the case of the Power Generator.

A normal reading is an “open” circuit (an infinite resistance).

If your meter shows any measurable resistance, from either terminal to the case, your Power Generator has a possible defect in its output power insulation system, and the generator should be returned to the factory for repair.

If the foregoing resistance readings are correct, a test of the output voltage of the generator under full field / full speed operating conditions should be made.

If you are using the generator in a welding application, this is done by starting the welder (pressing the power button or other on/off control in use) and rotating the power control to maximum (fully CW).

If you are using the generator in a charging/generating application, this is done by temporarily (and briefly) connecting one of the two control terminals to ground, and the other to a source of DC voltage between 12 to 14.5VDC while the generator is being rotated at a speed of between 6,000 to 7,000 rpm -- with both of the generator’s output terminals disconnected from any loads (particularly a battery).

A normal DC voltage reading between the positive and negative terminals of the generator, under these conditions, is between 70-80 volts. A reading substantially lower than this (say, 50-55 volts), indicates a possible failure in the generator’s rectifier or stator assemblies, and the generator should be returned to the factory for repair.

---

5 See enclosed instructions.
6 This sort of problem can be repaired in the field, by removing a foreign object, or moving a component which is touching the case interior, or replacing one of two sub assemblies. Additional trouble analysis, and some disassembly, may be required to determine which component to replace.
7 Use insulated 1/4” spade terminals or insulated clip leads for your connections to prevent an inadvertent short circuit during testing.
8 If desired, this component is field replaceable by a competent technician (or skilled owner).
ZENA™ Power Generator Care & Maintenance

The ZENA power generator is very robust. Other than keeping it clean, NO regular preventive maintenance is required.

A. Lubrication
   Not required. All moving parts are permanently lubricated.

B. Wet Conditions
   All critical electrical parts are sealed from moisture and all mechanical components are designed to operate in wet conditions (but not when immersed in water).

C. Cleaning
   Proper cooling is necessary for optimum performance and for maximum service life. Keeping your system’s components clean is most important.

1) Dust/Dirt Removal
   Compressed air is best for removing accumulations of dust and/or dirt from the interior and exterior surfaces of your Welding Power Generator. If compressed air is not available, clean by rinsing with a stream of soapy water followed by a fresh water rinse (DO NOT use water or strong detergent cleaning solutions from a pressure washer). After rinsing, excess water should be removed by using compressed air (if available), or by operating the engine briefly to allow the cooling fan to remove most excess moisture from inside the case.

2) Removing Corrosive Chemicals/Salts
   If your welder is operated around salt water, or used in conditions where its components may be exposed to corrosive chemicals, solvents, degreasers, antifreeze, and/or liquids with a high mineral content, it should be rinsed off with fresh water as soon as possible after exposure. Remove excess rinse water from the Welding Power Generator by using compressed air (if available), or by operating the drive engine briefly to allow the cooling fan to remove most excess moisture from inside the case.

3) Removing Grease and Oils
   If grease, hydraulic fluids, oils or other petroleum based lubricants cause dirt to accumulate on the OUTSIDE of system components, the component may be cleaned with any aerosol cleaner/ degreaser designed for electronic components, OR the outside surfaces can be cleaned with a clean cloth moistened with mineral spirits or kerosene.

   The interior of the generator can be cleaned with a light application of any aerosol cleaner/degreaser designed specifically for electronic components, AND/OR with a mixture of dish washing detergent (or some other mild detergent which is effective at removing/cleaning grease/oil).

   After cleaning, the generator should be rinsed with fresh water. Excess water should then be removed by operating the generator’s drive engine briefly with sufficient speed to drive

---

9 CAREFULLY read the product instructions and warnings BEFORE using any sort of aerosol based cleaner to insure that the cleaner is COMPLERELY safe for use with electronic components, AND/OR electrical varnishes, AND/OR all types of plastics or resins.

10 NOT detergents which are used for cleaning auto parts or which are, in any way, reactive with aluminum, or other metals
the generator to its normal operating speed to allow the cooling fan to remove most excess moisture from inside the case. If available, compressed air can be used to good advantage at this time to assist in the process of “drying” the generator.

4) After Operating in Wet Conditions

Excess water should be removed from the Welding Power Generator by operating the vehicle’s engine briefly to allow the cooling fan to remove most excess moisture from inside the case. Excess water can be removed from the Control Handle’s internal components by simply hanging the Control Handle so that its electrode holder points “down”. Moisture trapped in the handle or its components will drain out or evaporate.

D. DO NOT…

● use spray lubricants of any sort on any component; or
● operate the unit in very dusty and or dirty conditions without insuring that cooling air reaching the unit is as dust and/or contaminant free as possible; or
● allow antifreeze compounds to contact system components without cleaning the affected component with fresh water; or
● allow accumulations of grease and/or dirt to form on system components; or
● apply any sort of paint to any system component; or
● clean system components with aerosol brake cleaners, carburetor cleaners, spray degreasers, or other chemicals except as noted above in “Cleaning” above.
Cleaning Slip Rings/Brushes

Cleaning can be accomplished in the field, if necessary -- but is best done under factory (dust free) conditions. Factory cleaning will be performed free of any labor charge, with charges only for return freight cost.

However, if circumstances dictate that you need to clean the unit yourself, carefully follow these instructions:

**Step 1 – Inspection Cleaning PRIOR to Removal from Drive Motor**

If slip ring/brush cleaning is needed because of oil or chemical contamination, before removing the generator from its drive motor/engine, or beginning disassembly of the generator, inspect the power generator for residual amounts of antifreeze, grease, hydraulic fluids, or oil on the outside of the generator or on visible internal components.

If contamination of the exterior is noted, the **exterior** of the generator may be cleaned with any aerosol cleaner/dgreaser designed specifically for electronic components\(^{11}\), AND/OR with a clean cloth moistened with a solvent such as mineral spirits or kerosene, AND/OR with a mixture of dish washing detergent (or some other **mild** detergent\(^{12}\) which is effective at removing/cleaning grease/oil).

The **interior** of the generator can be cleaned with a **light** application of any aerosol cleaner/dgreaser designed specifically for electronic components\(^{13}\), AND/OR with a mixture of dish washing detergent (or some other **mild** detergent\(^{14}\) which is effective at removing/cleaning grease/oil).

After cleaning, the generator should be rinsed with fresh water. Excess water should then be removed by operating the generator’s drive engine briefly with sufficient speed to drive the generator to its normal operating speed to allow the cooling fan to remove most excess moisture from inside the case. If available, compressed air can be used to good advantage at this time to assist in the process of “drying” the generator.

**Step 2 -- Disassembly**

Place the generator on a clean, dust free workbench -- resting on its side.

Identify/locate the four Allen head cap bolts that hold the generator case parts together.

---

\(^{11}\) **CAREFULLY** read the product instructions and warnings **BEFORE** using any sort of aerosol based cleaner to insure that the cleaner is **COMPLETELY** safe for use with electronic components, AND/OR electrical varnishes, AND/OR all types of plastics or resins. If **ANY** doubt as to suitability of a chemical exists – **DO NOT USE IT**.

\(^{12}\) **DO NOT USE** detergents which are used for cleaning auto parts or which are, in any way, reactive with aluminum, or other metals.

\(^{13}\) **CAREFULLY** read the product instructions and warnings **BEFORE** using any sort of aerosol based cleaner to insure that the cleaner is **COMPLETELY** safe for use with electronic components, AND/OR electrical varnishes, AND/OR all types of plastics or resins. If **ANY** doubt as to suitability of a chemical exists – **DO NOT USE IT**.

\(^{14}\) **DO NOT USE** detergents which are used for cleaning auto parts or which are, in any way, reactive with aluminum, or other metals.
Then, using a properly sized, unworn, Allen wrench, loosen first one pair of opposing bolts – then the second pair. When all four bolts have all been loosened, remove all four bolts from the case\textsuperscript{15} and set them aside.

Locate the point where the front case and the iron lamination of the stator assembly meet. With a small screwdriver, working around the case perimeter, gently pry the front case assembly away from the stator assembly. At this point, you should gently pull the two sections of the generator apart while taking care to support the considerable weight of the rotor section which is normally supported by the needle bearing located in the rear case assembly.

At this point, the rotor shaft end will likely have a bit of bearing grease on it. Wipe off this grease and place the front case/rotor assembly onto your workbench.

As the rotor assembly is removed, the brushes will spring free of the brush guide. The brushes must be returned to their guides, and be held in place, until reassembly of the generator is complete.

For the model SR150 and SR250 series generators, the brushes can usually be pushed back into place by hand (or by gentle manipulation with a pair of needle nosed pliers) and then held in place by a straightened paper clip threaded through the holes provided in the brush assembly, brushes\textsuperscript{16}, and the rear generator case.

For the model SR200 series generators, the brush assembly must be removed from the rear case in order to reposition, and secure, the brushes for reassembly of the generator. Removal is simple, requiring only a 1/4” nut driver to remove the two #8 hex head machine screws which hold the brush assembly in place. With the brush assembly outside of the case, the brushes can be easily pushed back into place, by hand, and then held in place by a straightened paper clip. As the brush assembly is reinstalled, the wire is threaded through the holes provided in the rear generator case.

**Step Three – Slip Ring Cleaning**

The copper slip rings can usually be cleaned by simply by rubbing briskly with a rough cloth soaked in denatured alcohol. Cleaning can also be accomplished by very carefully using a strip of a very fine grade wet or dry polishing sandpaper - greater than 1200 grit. Though this method presents some risk that the contour of the slip rings might be altered – possibly affecting future performance and brush service life.

However, much better, safer, and quicker results can be obtained by using a common, and popular, household metal polish designed for cleaning/polishing brass and copper – sold in the USA under the trade name Brasso\textsuperscript{®}. This compound will make quick work of the job, leaving the copper slip rings bright and shiny with little chance of changing the contour of the slip rings. Once clean, the slip rings should be wiped off with a cloth soaked in denatured alcohol to remove any polish residue which might impair future performance.

At this time, the brushes should also be wiped off with the alcohol soaked cloth to remove any greasy reside which may reside on the brush surface.

\textsuperscript{15} When removing SR200 series generator case bolts, take care to not loose the four stainless 3/8” nuts which are used as spacers between the two sections of the rear housing assembly.

\textsuperscript{16} When brushes are new, holes in the brushes facilitate the use of a brush retaining wire. After some time in use the, portion of the brushes with holes for the retaining wire will be worn away. At this point the brushes are not worn out or unserviceable, only about a third of their useful service live has been expended.
Step Four – Reassembly

Place the rear generator case on the bench top – orienting the generator case so that the rotor assembly can be gently lowered into the case until the end of the rotor shaft enters the rear needle bearing.

At this time take particular care that the output terminals are positioned, in relation to the generator mounting foot and tensioning tab so as to meet the needs of your particular installation.

Once in place the generator should be placed on its side.

At this point, gently press together the two case halves insuring proper fit of the stator assembly’s iron laminations into the front case assembly. NOTE the two parts may not be in full contact at this point – however, the case parts will be pulled into position as the case bolts are inserted and tightened.

Insert the four case bolts removed previously making sure, if reassembling a model SR200 series generator, not to forget to position the generator’s four stainless steel 3/8” spacer nuts. Loosely firm up all four bolts then continue to tighten an opposing pair to a moderate degree of tension. Then do the same with the other opposing pair.

Now, moving around the generator, moving from one adjacent bolt to another, tighten the bolts bit by bit until all are fully secure.

As a final step, remove the wire segment holding the brushes away from the slip rings. On the SR150 and SR250 series generators this wire extends from inside the case near the rear bearing support. On SR200 series units you will likely need a pair of needle nosed pliers to grip the wire and pull it free of the rear case.

This completes the reassembly process.

Your generator may now be retested, and if found satisfactory, returned to service.
Return for Service

If you determine that you have a problem which requires either further troubleshooting assistance from our tech support department or need a return authorization for a possibly malfunctioning component for test/repair call 877-ZENA INC (toll free in the USA) or 615-897-2011, e-mail us at support@zena.net, or you can FAX us at 615-897-2023.

If, for any reason, you cannot reach us by phone, it is permissible to return the suspect component for repair without a formal authorization. Just make sure that you include a written description of the problem that you have found as well as a legible return address (and a telephone #, if available, that we can uses if it is necessary to contact you).

IF YOU DO HAVE TO RETURN AN ITEM, insure it and make sure that it is packed carefully and properly (use our packaging materials if at all possible).

- **DO NOT USE** foam “peanuts” for padding (dust from these can get into your welding equipment and cause future problems) or any other type of Styrofoam packaging materials that can crumble when broken/torn/stressed.
- **MAKE SURE** that at least 2” of firm padding material (paper/cardboard, bubble-wrap, or non crumbling foam (like the foam pads that we use in our packaging) is placed on all sides of any item so that the item is FIRMLY held safely in the center of the package -- **DO NOT SCRIMP ON PADDING**.
- **USE A GOOD** quality box with STRONG side walls.

Careful attention to packaging will avoid extra charges for shipping damages.